

IV. ENDO-ANEURYSMORRHAPHY (MATAS).

BY CHARLES H. FRAZIER, M.D.,

OF PHILADELPHIA.

ONE of the most fascinating chapters in the history of modern surgery concerns the application of the suture as applied to lesions of the vascular system. These revolutionary measures have attracted wide attention not only because of their applicability to the treatment of the everyday lesions of the vascular apparatus, but because in simplifying the technic of direct transfusion they open a field of speculation, the possibilities of which are just beginning to dawn upon us.

The history of the development of the suture in the surgery of the vascular system and its applicability to the treatment of aneurysm has been so graphically described by Matas that I will confine my remarks to my personal experience with his operation, adding such comments as may be suggested by the conditions which presented at or after the operation.

CASE 1. B. T. (University Hospital, No. 1313, Series 2.)
Popliteal Aneurysm: (Sacciform) Endo-Aneurosmorrhaphy (reconstructive): Recovery.

A colored man, 38 years of age, was referred to me by Dr C. S. Weeks in April, 1906. He was a waiter by occupation. He had had syphilis about eighteen years ago and was addicted to the free use of alcohol and tobacco. Eight months ago (September, 1905), the patient began to complain of a dull pain in the popliteal space. The knee joint felt stiff and the patient thought he had rheumatism. The pains and stiffness increased but it was not until two months later (December, 1905) that he noticed a small swelling, about the size of a chestnut, in the right popliteal space. The swelling gradually increased in size, until one month before his admission to the hospital, when it began to increase so rapidly that he was obliged to give up his work.

Upon examination there was found a pulsating tumor occu-

pying the lower portion of the popliteal space measuring 10 cm. in its longitudinal and 11 cm. in its transverse axis. The circumference of the limb over the tumor was $32\frac{1}{2}$ cm. as compared with 29 cm. on the unaffected limb. The leg below the aneurysm was somewhat swollen and the superficial veins quite prominent. There was a visible expansile pulsation and a marked bruit on auscultation. Pulsation could not be felt in the anterior tibial vessel. Operation. April 28, 1906. Under nitrous oxide-ether anæsthesia, an Esmarch tube having been applied to the thigh, a longitudinal incision was made directly over the tumor. Upon opening the sac a careful inspection proved that we were dealing with an aneurysm of the saccular or sacciform type, having but one communication with the parent artery. The operator then proceeded to remove the clot which partially filled the aneurysmal sac. This proved to be a rather slow process because the laminæ, particularly the deeper ones, were well organized and quite adherent to one another. These were peeled off as one peels an onion. Microscopically these clots were found to be well organized, being composed of a stroma of young connective tissue within which were sprouting newly formed blood vessels. When the sac wall was finally stripped of its clots the single communication with the artery was closed with a continuous silk suture and the sac cavity obliterated by means of two layers of fine silk sutures. The cutaneous wound was closed with silk worm gut suture, the dressing applied, and fixation assured with a posterior splint. The post operative convalescence was devoid of interest. At no time was there any cause for apprehension as regards the vitality of the limb below the seat of operation. The temperature of the foot on the affected side was unaffected, the limb was not swollen so that I was quite sure neither the arterial nor venous circulation had been affected by the operative manipulations. The patient complained of numbness in the limb for a few days but this sensation soon passed off. There was some suppuration in the upper layers of the wound. While accidental infection may occur in any wound there are two factors, which in this particular operation may be regarded as predisposing causes, one traumatism, such as may be inflicted in removing the laminated clot, the other, impairment of circulation; Matas, in speaking of the chief points to be observed in closing the wound, says "too tight or too many sutures must be avoided in order not to compromise the circulation of the sutured tissues."

When the patient was discharged from the hospital there was no pulsation detected in the anterior tibial artery, a condition which was noted before the operation. The patient was examined in October, 1906, nine months later, when there was no signs of recurrence.¹

Comments.—In this case I was surprised with the comparative simplicity of the procedure from the technical standpoint. There was of course no difficulty in rendering the field of operation bloodless, the aneurysm was easy of access. At no time was there any danger or fear of injuring the popliteal vein, which there would have been had any attempt been made to remove the sac. Whatever difficulty there may have been was entailed in removing the laminated clot and in determining when the intima had been reached. The layers which composed the clot were firmly adherent one to the other, in fact there was, as proven by microscopic examination, absolute union between the layers. A good deal of force had to be applied to separate them from the sac wall, and on several occasions I thought the intima had been reached only to find one or more layers still adherent. With more experience and with greater familiarity with the gross appearance of the structures involved this step of the operation could have been conducted more expeditiously. The necessity of removing everything necessary to lay bare the intima is apparent; inasmuch as the success of the operation depends absolutely upon the apposition and union of the serous coat of the aneurysmal sac and arterial orifice. The single communication with the parent artery was situated at the bottom of the sac near its upper extremity and not in the middle. We are accustomed to see the communication with the artery, in cases of saccular aneurysm, diagrammatically represented about the middle of the sac. This was the position in which I expected to find it in this case; failing to find it there, it was some time before I discovered it near the upper pole.

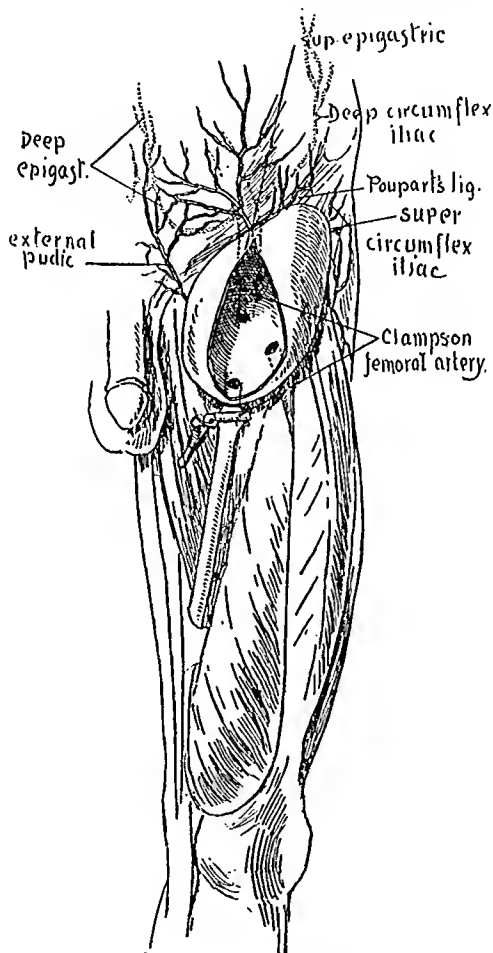
¹ The patient died January, 1907, of pneumonia, at which time it was reported that there was no recurrence.

CASE 2. T. S. (University Hospital No. 1785) *Femoral Aneurysm (Sacciform: two communications with parent artery) Endo-Aneurysmorrhaphy, (obliterative) Gangrene, Amputation, Recovery.*

A colored man, 34 years of age, presented himself for treatment at the University Hospital, October 8th, 1906. He had contracted syphilis eight years ago, he used alcohol very freely and his occupation, as a porter, required him to lift heavy objects. Although by occupation and habit he had paved the way for aneurysmal formation he attributed the lesion to an injury which he had received three months ago. He struck the groin against the corner of a table and two weeks later he noticed in the femoral region a small lump, which increased in size and soon began to pulsate. An examination revealed a powerful subject with numerous cicatrices on the cutaneous surface, the result of old syphilitic lesions. The arteries did not seem to be sclerotic. Extending from Poupart's ligament to the apex of Scarpa's triangle and some 12 cm. in width was the aneurysmal tumor. Pulsation was controlled by pressure upon the femoral artery just below Poupart's ligament. Below the knee the limb was swollen, the patient complained of a sense of numbness about the knee, and of so much pain that for the past two weeks he has been scarcely able to walk. The character of the operation and its risks were clearly explained to the patient.

Operation.—October 10, 1906. Owing to the situation of the aneurysm, close under Poupart's ligament, it was quite evident that it would not be feasible to use a tourniquet. I proceeded accordingly to close temporarily the external iliac artery: this was done through an oblique incision just above and parallel to Poupart's ligament; an arterial clamp was applied and as an additional precaution a heavy silk ligature was thrown around the vessel, but not tied. This accomplished, a vertical incision was made over the site of the tumor, the aneurysm exposed, the artery below the aneurysm isolated and an arterial clamp applied here. Having taken the precaution to close the artery on both the cardiac and distal side of the sac, I hoped to be able to proceed with the operation unembarrassed by hemorrhage. Upon opening the sac, however, a large column of blood spurted out a foot or more above the table. My first thought was that the blood which made its escape represented what was present in

the aneurysm under more or less tension, but it soon became apparent that active bleeding was going on in the aneurysmal sac.



Femoral aneurysm:—showing openings in floor of sac.

The bleeding was so profuse as to give cause for alarm. I have never seen so free and apparently uncontrollable hemorrhage.

The cavity was packed firmly with gauze, and an attempt made with firm pressure to control hemorrhage, but this was only partially successful. The pulse soon rose to 160 then to 170; normal saline solution was given by hypodermoclysis and other appropriate remedies. It was quite evident that some more effective means must be adopted to save the patient's life. I proceeded as rapidly as possible to expose little by little the inner wall of the sac and found two openings, one on the floor and one on the lateral aspect of the sac, from both of which the blood was streaming. Direct pressure was made upon the openings with the tips of two fingers, and by this means only was bleeding finally arrested and an opportunity offered to inspect the sac. The latter was found to have three openings, two on the floor and one on the side. These were closed as rapidly as possible with fine catgut sutures. The laminated clot was then peeled off, as in the first case, and the cavity of the sac obliterated by taking up the lateral folds and bringing them together with a continuous mattress suture after the manner prescribed by Matas. Three layers of sac superimposed over the arterial orifices sufficed to obliterate most of the aneurysmal sac; there still remained a small pocket at the upper pole, so far distant from the artery itself, that there seemed to be no objection to leaving it undisturbed. A drainage tube was introduced, the wound closed with interrupted silk worm gut sutures. After the dressing was applied the limb was enveloped in cotton and elevated. The patient's condition when he left the table was better than it was earlier in the operation. On the following day the toes were exposed and found to be warm, but anæsthetic; there was no pulsation in the dorsalis pedis. On the fourth day the patient complained of pain in the calf of the leg, there was marked tenderness when pressure was exerted over the course of the posterior tibial vessels, the limb was evidently swollen, and the foot was cold. It was quite evident that the circulation was seriously impaired and that gangrene would follow. The line of demarcation soon formed and the limb was amputated. A careful dissection of the specimen made for me by Dr. B. A. Thomas revealed the cause of the gangrene in a thrombus which had formed in the popliteal vessel just above its bifurcation, and extending for a short distance into both tibial vessels.

This case has been presented in greater detail than would at first sight seem warranted, because of two more or less distinctive features; the tremendous hemorrhage and the gangrene. Of the 35 or 40 cases that are on record this is the first case in which gangrene followed an uncomplicated endo-aneurysmorrhaphy. This was a very unfortunate occurrence, inasmuch as one of the strongest arguments in favor of the Matas operation is its safety to the patient and to the parts involved, because of the non-interference with the collateral circulation and the avoidance of gangrene. The operation is founded upon such sound principles and the mode of procedure has been so carefully elaborated by Matas that I am quite willing, if not anxious, that in this case some error in technique may be discovered which will account for the thrombus formation and ultimate gangrene. From the subjective and objective symptoms it would seem that the thrombus had obliterated the vessel on the third or fourth day. The process may have originated at the site of the thrombus or it might have been due to the lodgment at that point of an embolus. There was an accidental infection of the wound, but there could be no relation of cause and effect between an infection above the seat of the aneurysm and the thrombus below the aneurysm, a segment of obliterated vessel intervening between the two. It seems much more reasonable to attribute the thrombus formation to an inadequate collateral circulation.

The second rather distinctive feature was the tremendous hemorrhage. One of the conditions which Matas considers essential for the success of the operation is provisional or temporary hemostasis. The aneurysm should be so situated that provisional hemostasis may be obtained by controlling the proximal arterial supply of the tumor on the cardiac side. "When circular constriction (as in my case) is impossible great care must be observed, writes Matas, in securing the distal as well as the cardiac side of the main trunk in order to obtain a comparatively bloodless field." Accordingly I closed temporarily with arterial clamps the vessel on the distal and proximal side with what results has already been told.

While the hemorrhage was most profuse, it was at the same time a most instructive demonstration, for it proved at once how utterly futile in this case it would have been to have practiced one of the older operations, particularly ligation, and illustrated beautifully the point upon which Matas has so frequently laid stress, namely, that the complete obliteration of the sac and the freedom from recurrence depends not only upon closure of the parent artery, but the collateral branches.

Had the reconstructive rather than the obliterative type of operation been carried out gangrene might not have occurred. There were two communications with the parent artery, but there was nothing left by which the course of the parent artery between the two openings could be recognized. It was blended with the aneurysmal sac throughout its circumference. Even had it seemed possible or desirable to reconstruct the artery the operation in this case could not have been carried out in the presence of so much free and uncontrollable bleeding.

Because of the evidence of so free a collateral circulation I was disposed to give a favorable prognosis as to the preservation of vitality and was much surprised when gangrene developed. While there is an erroneous impression that the Matas operation implies the reconstruction of the artery, "for all practical purposes the preservation of the continuity of the artery is not assential to success and is only indicated positively in the sacciform aneurysm with a single opening, when the parent artery already exists as a formed vessel." (Matas.) With this experience, however, I should be disposed in the future particularly in femoral aneurysms and under favorable conditions to attempt to reconstruct the artery, rather than depend entirely upon the collateral blood supply.